

A REAPPRAISAL OF *CLEMATOSTIGMA* ENDERLEIN WITH NOTES ON RELATED GENERA (PSOCOPTERA: PSOCIDAE)

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Abstract

Clematostigma Enderlein is redefined and compared with other genera of the *Copostigma-Clematostigma-Ptycta-Maheella* complex. Each is defined as far as available data allow and species for each listed where feasible in an attempt to reduce some of the confusion surrounding these genera. A neotype is designated for *Copostigma maculiceps* Enderlein, the type species of *Clematostigma*. *Tanystigma* gen. nov. and *Tiliapsocus* gen. nov. are proposed as genera to hold species which cannot be retained as being congeneric with the type species of *Clematostigma*.

Introduction

Enderlein (1903) erected the genus *Copostigma* to hold those species of Psocinae in which there is a spurvein arising from the posterior angle of the pterostigma. He designated *C. dorsopunctatum* Enderlein, from New Guinea, as type species, and included *C. fumatum* Enderlein, from New Guinea, *C. maculiceps* Enderlein, from Australia, *C. indicum* Enderlein, from India, *C. brevistylus* Enderlein, from New Guinea and *Psocus palliatus* Hagen, from Ceylon.

Later (Enderlein 1906) he erected *Clematostigma*, with *C. maculiceps* as type species and included, amongst others, all the species previously in *Copostigma* except *C. dorsopunctatum* and *C. palliatum*. The latter was not mentioned but is, in fact, a species of Caeciliidae. *Copostigma* was thus reduced to a monotypic genus. He distinguished the two genera, both of which have a pterostigmal spurvein, by the fusion of Rs and M in the fore wing in *Clematostigma* and by these veins being joined by a crossvein in *Copostigma*.

Subsequently (Enderlein 1925) he erected the genus *Ptycta*, with *Psocus haleakalae* Perkins, from Hawaii, as type species and distinguished it from *Clematostigma* by its having the first section of Cu_{1a} shorter than the second; he pointed out that in *Ptycta* the pterostigmal spurvein was not always clearly developed. His definition of *Ptycta* implies that in *Clematostigma* the first section of Cu_{1a} is longer than the second and it is shown so in his earlier illustration (Enderlein 1906, Pl. 23, fig. 3).

In the same paper (1925) he also erected the monotypic genus *Mecampsis*, with *M. cinctifemur* from Chile, as type species. He distinguished *Mecampsis* from *Copostigma* by the first and second sections of Cu_{1a} being in a straight line or almost so. His comparison implies that in *Mecampsis* Rs and M are not fused for a length and that in *Copostigma* the two sections of Cu_{1a} are at an angle to each other. The latter is confirmed by his figure of *C. dorsopunctatum* (Enderlein 1903, Pl. IV, fig. 15).

To the above four genera he added *Maheella* (Enderlein 1931) from the Seychelles, with *M. laevidorsum* as type species. *Maheella* cannot be distinguished from *Ptycta* on the basis of his definitions and is now generally regarded as

being theoretically synonymous with it although it may be distinguishable in practice. Study of the type of *Maheella* is necessary before the matter can be settled.

With venational characters defining these genera and given the variation sometimes found in the development of the pterostigmal spurvein and the relationships between Rs and M there has inevitably been, in the absence of information on other features such as genitalia, uncertainty regarding the placing of many species. Badonnel (1967) has referred to this group of genera as the *Copostigma-Clematostigma-Ptycta-Maheella* complex.

To this complex of genera should be added *Indiopsocus* Mockford, with the North American *Psocus texanus* Aaron as type species (Mockford 1974). This genus was erected to hold a group of North American and Cuban species. It is clearly very closely related to *Ptycta*.

The problem of generic definition has been aggravated by several factors. Species recently placed in *Ptycta* have included some with and some without a pterostigmal spurvein and some with various Rs-M relationships ranging from those in which Rs and M are fused through those in which these veins meet in a point to those in which a distinct crossvein is present. The types of *C. dorsopunctatum* and *C. maculiceps* deposited in the Hungarian Natural History Museum have been destroyed by fire. Roesler (1944), in a key to the genera, placed *Clematostigma* and *Mecampsis* as subgenera of *Copostigma*. He also introduced the unreliable character of presence or absence of marginal wing setae as differentiating *Ptycta* from the other genera. This was not used by Enderlein in his original diagnosis.

Material at present being studied and papers by several authors (e.g. Badonnel 1967, New 1974, Smithers 1977) indicate that there are many species involved in this complex. If they continue to be placed in ill-defined genera or in a "holding" genus, such as *Psocidus* Pearman, their value as data in group relationship or zoogeographic studies is reduced. It is, therefore, important that an attempt be made to clarify the matter as much as possible without waiting for a complete revision of the family.

Material of Psocidae now available includes some which is undoubtedly referable to *C. maculiceps*. It was collected at the type locality, Sydney. A redescription of *Copostigma maculiceps* Enderlein [= *Clematostigma maculiceps* (Enderlein)] and designation of a neotype of *Copostigma maculiceps* is given here and provides a base from which the problems of this complex may be approached.

Redescription of *Copostigma maculiceps* Enderlein

(Figs 1-8)

MALE

Coloration (in alcohol). Head yellowish brown with dark brown markings (cf. Enderlein 1903, Pl. IV, fig. 12). Median epicranial suture very dark, anterior arms evanescent but a broad brown line occurs in their position. Irregular confluent spotting on either side of median epicranial suture, across

back of head and adjacent to inner margin of compound eyes. A brown mark between lateral ocellus and nearest mark of those adjacent to compound eye. Ocellar tubercle brown. Brown patch with pale centre between ocellar triangle and epistomial suture. Postclypeus with twelve parallel brown lines, the two middle ones closer together than others. Anteclypeus pale anteriorly, dark brown posteriorly. Labrum dark brown with paler anterior band, the band interrupted by two dark spots, one on either side of midline. Genae not marked. Scape and pedicel brown, as is basal part of first flagellar segment; remainder of antenna darker. Eyes black. Maxillary palp pale, third segment brown, fourth segment darker, almost black. Mesothoracic antedorsum shining dark brown; parapsidal sutures pale so that the mesothoracic notum is marked with a pale V; dorsal lobes dark brown with pale line posterolaterally. Mesoscutellum brown, the mesonotum laterad of scutellum very dark brown. Fore coxae pale, others dark brown. Femora pale brown with narrow dark apical band; tibiae and tarsi dark brown. Fore wings (Fig. 1) hyaline with dark brown pterostigma which is a little paler towards wing base and with dark brown postpterostigmal mark ending abruptly at spurvein. Veins brown. Hind wings hyaline, veins brown. Abdomen pale with irregular darker annulations; terminal structure dark brown.

Morphology. Length of body: 3.0 mm. Median epicranial suture very distinct, anterior arms evanescent (but position marked by brown band). Epistomial suture transverse in middle, curving forwards laterally to antennal sockets. Length of flagellar segments: f_1 : 0.92 mm; f_2 : 0.84 mm. Setae on antennae up to three times flagellum width. Eyes fairly large but not reaching level of vertex. IO/D (Badonnel): 1.9; PO: 0.9. Ocelli large, anterior ocellus a little smaller than lateral ocelli. Measurements of hind leg: F: 0.76 mm; T: 1.64 mm; t_1 : 0.44 mm; t_2 : 0.16 mm; rt: 2.8; 1; ct: 20, 4. Hind tibiae long and slender; first tarsal segment slightly curved. Fore wing length: 3.7 mm; width: 1.4 mm. In fore wing Sc ends free in costal cell. Pterostigma concave before hind angle. Spur vein present at hind angle, poststigmal mark ends at spurvein. Rs and M fused for a length. Discoidal cell distally slightly concave, sides of cell not parallel. First and second sections of Cu_{1a} at an angle to each other, not in the same straight line, second section obviously shorter than first. Hind wing length: 2.6 mm; width: 1.0 mm. Rs and M fused for a fairly long length. A few minute marginal setae between arms of radial fork. Ninth tergite unusual, extended back at sides and medially between the paraprocts; lateral extensions with irregularly serrate inner margin; median backward extension bears the epiproct. Epiproct (Fig. 3) reduced, bilobed posteriorly, lightly sclerotized except for two longitudinal sclerotized bars and bearing a pair of large, lightly sclerotized, erect lobes; apex with two setae. Paraprocts (Fig. 3) elongate, well sclerotized with large, circular trichobothrial field and with a terminal upturned lobe. Hypandrium (Fig. 6, postero-ventral view) bowl shaped, upturned behind; the upturned section broadly bilobed; basal part with a short, strongly sclerotized curved marginal bar on each side. Phallosome (Fig. 2) closed posteriorly with very large, outwardly curved, apically split outer parameres.

FEMALE

Coloration (in alcohol). Head as in male but markings paler, brown rather than dark brown. Antennae paler than in male. Maxillary palps with only fourth segment dark. Legs as in male but tibiae dark only at distal end, otherwise pale brown. Fore wing (Fig. 7, cf. also Enderlein 1906, Pl. 23, fig. 3) hyaline marked in shades of brown.

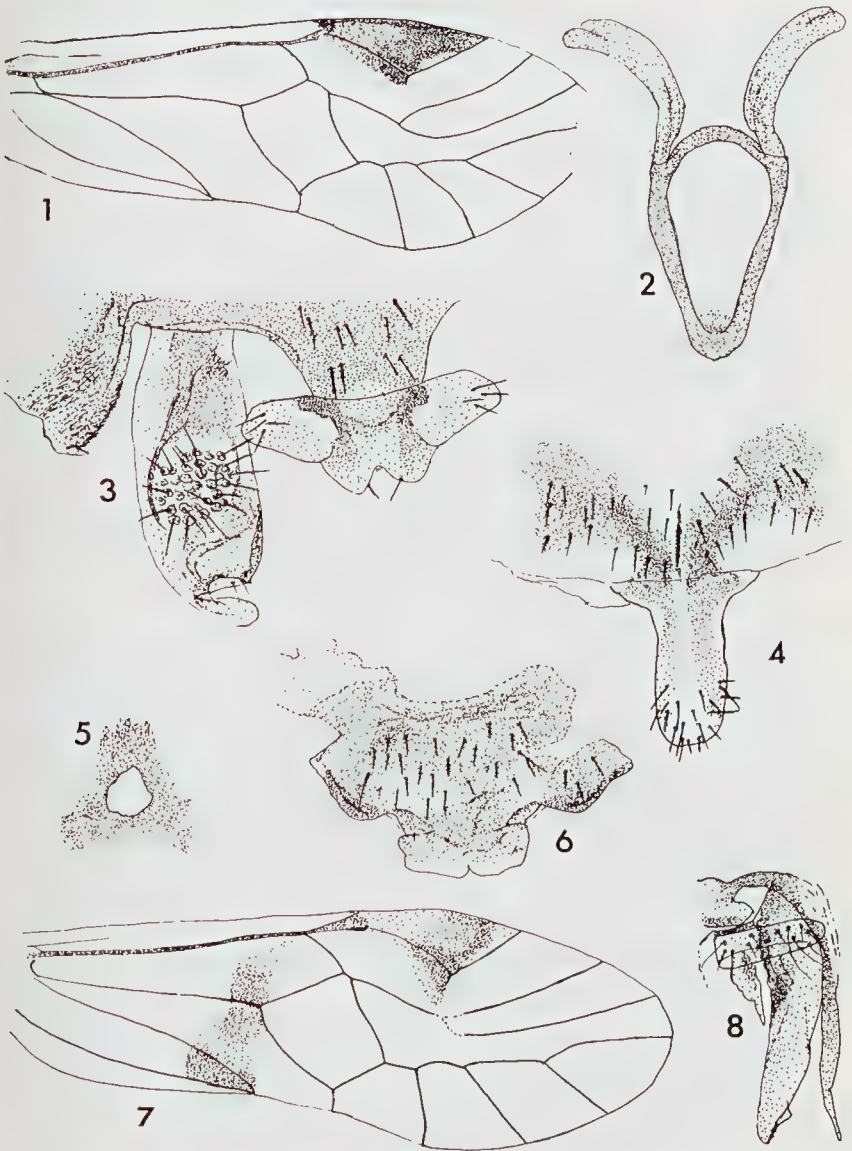
Morphology. Length of body: 3.6 mm. Epicrainal suture as in male. Length of first flagellar segment: f_1 : 1.0 mm. Eyes smaller than in male, the top of the eyes well below vertex. IO/D (Badonnel): 2.5; PO: 0.9. Anterior ocellus much smaller than lateral ocelli. Measurements of hind leg: F: 0.88 mm; T: 1.88 mm; t_1 : 0.44 mm; t_2 : 0.20 mm; rt: 2.2: 1; ct: 19, 4. Fore wing length: 4.3 mm; width: 1.5 mm. Fore wing (Fig. 7) venation similar to that of male; second section of Cu_{1a} much longer relative to first section than in male. Hind wing length: 3.2 mm; width: 1.1 mm. Venation and setae as in male. Epiproct lightly sclerotized, about as long as basal width but narrowing a little posteriorly; lateral margins in basal half strengthened by a sclerotized bar on each side, the ends of which are connected across the middle of the epiproct by a slightly narrower but similar bar; scattered, long, fine setae occur mainly distad of the transverse bar. Paraprocts broadly triangular, sclerotized, with large, round trichobothrial field. Subgenital plate (Fig. 4) with long posterior lobe and Y-shaped pigmented area, the stem of the Y extending into posterior lobe as a double band; arms of Y broadened anteriorly and stem widened a little near origin of arms of Y, Gonapophyses (Fig. 8) with very long ventral and dorsal lobes, both pointed. External valve narrowly transverse with a tapering posterior lobe. Sclerification of ninth sternite (Fig. 5) ring like with a small anterior rugose area.

MATERIAL EXAMINED. NEW SOUTH WALES: 1 ♂ (neotype), Ryde, 2.ix.1972, J. V. Peters; 1 ♂, 8 ♀, same data as neotype; 1 ♀, College St., Sydney, 3.iii.1975, C. N. Smithers; 5 ♀, Lindfield, 19.xi.1970, J. O'Regan; 1 ♂, Woronora River, Engadine, 20.x.1973, G. A. Holloway; 3 ♀, Lindfield, 28.x.1971, A. S. Smithers; 1 ♂, 3 ♀, 14 nymphs, Ryde, 5.iv.1974, J. V. Peters; 1 ♂, 1 ♀, Lindfield, 10.xi.1970, A. S. Smithers; 2 ♀, Ryde, 30.iii.1974, J. V. Peters (AM); 11 ♂, 12 ♀, Lindfield, 19.xi.1970, C. Trickett (HM). Neotype and other material is in the Australian Museum (AM) and the Hungarian Natural History Museum (HM).

Discussion and conclusions

This material reveals that *Clematostigma* has several unusual features not apparent from earlier descriptions and that some of the features used earlier are sufficiently stable to warrant their use in comparing species in several genera. Of particular note are the following.

The pterostigma has a distinct hind angle, that is the pterostigma is concave basad of the point at which the pterostigmal spurvein arises. The spurvein is always present but variable in degree of development. Rs and M are fused in the fore wing. The first section of Cu_{1a} is longer than the second, somewhat sinuous in the male and at an angle to second. The male fore wing



Figs 1-8. *Clematostigma maculiceps* (Enderlein). (1) ♂ fore wing; (2) ♂ phallosome; (3) ♂ epiproct, paraproct, ninth tergite; (4) ♀ subgenital plate; (5) ♀ spermathecal entrance; (6) ♂ hypandrium; (7) ♀ fore wing; (8) ♀ gonapophyses.

is hyaline except for the pterostigma and the postpterostigmal mark whereas the female has in addition a variably developed nodal mark (cf. Enderlein 1906, Pl. 23, fig. 3). The male has a pair of erect, setose lobes near the base of the epiproct. The paraprocts do not have a basal lobe. The hypandrium is symmetrical, not adorned with teeth, apophyses nor other projections and does not have a median, upcurved, straplike posterior extension. The phallosome is closed behind by the arch-like inner parameres and has two very large, outwardly curved external parameres. The female subgenital plate has a long posterior lobe with Y-shaped sclerotization, the stem of the Y being divided to the end of the lobe by a more lightly sclerotized area. The ventral and dorsal valves of the gonapophyses are very long and the external valves narrow and transverse with a clearly developed, narrow based, tapering lobe arising from the dorsal side.

The above features in combination can be considered to characterize *Clematostigma*. Of special significance is the form of the male phallosome which is closed with large external parameres, unusual for the Psocidae. Most species either lack obvious external parameres and have the phallosome in the form of a closed ring or they have a posteriorly open phallosome with posteriorly directed external parameres. In the extreme form (e.g. *Amphigerontiinea*) the phallosome is reduced to two separate sclerites, each possibly representing the external paramere of one side. In the female the elongate gonapophyses and the form of the external valve lobe are characteristic.

The peculiarities of the features described above warrant retention of *Clematostigma* at generic rank.

There are at present sixteen described species in *Clematostigma*, five in *Copostigma*, one in *Mecampsis*, seventeen in *Indiospocus* and fifty seven in *Ptycta*.

Of the sixteen species in *Clematostigma* the morphology of only eight is reasonably well known and seven of these differ from *C. maculiceps* in some important features. None of the known males has a closed phallosome. The subgenital plates and dorsal and ventral valves of the gonapophyses are not long and the lobe on the external valve does not present the unusual form found in *C. maculiceps*. On the basis of these differences they cannot be retained as congeneric with *C. maculiceps*. The species involved are *C. dubium* New, *C. edwardsi* New, *C. inglewoodense* New, *C. latimentula* Smithers, *C. paulum* Smithers, *C. tardipes* Edwards and *C. morio* (Latreille). The position of the remaining eight species [*C. brevistylus* (Enderlein), *C. fumatum* (Enderlein), *C. hyalinum* (Okamoto), *C. indicum* (Enderlein), *C. paraguayense* Enderlein, *C. subcostalis* (Okamoto), *C. tunicum* Enderlein and *C. vinctum* (Enderlein)] cannot be discussed without further studies and for the present they must remain in *Clematostigma*. *Clematostigma* is, therefore, regarded here as a genus in which only one species has been well characterized with the eight additional species listed above as being attached to it pending further study.

Amongst the seven reasonably well known species listed above which require removal from *Clematostigma* two groups can be distinguished each of which should be given generic rank.

Clematostigma morio, a parthenogenetic species, stands apart from the others in having a subgenital plate which has a short, rounded posterior lobe; the dorsal valve is fairly short and broad. The pterostigma is concave basad of the distinct hind angle. For this species the name *Tiliapsocus* gen. nov. is proposed with *Psocus morio* Latreille as type species.

The remaining species have a relatively shallow pterostigma; the known males have a posteriorly open phallosome and a symmetrical hypandrium without teeth or apophyses. For this group I propose the name *Tanystigma* gen. nov., with *Copostigma* (*Clematostigma*) *paulum* Smithers as type species. Other species to be included are *C. dubium*, *C. edwardsi*, *C. inglewoodense*, *C. latimentula* and *C. tardipes*.

Clematostigma and *Tanystigma* both differ from the species in the *Indiopsocus* and *Ptycta* complex in the form of the male phallosome which is closed in the *Indiopsocus-Ptycta* complex but without external parameres.

Comments on *Copostigma* and *Mecampsis*

Copostigma was defined on venational features. After removal to *Tanystigma* of the species described by me in *Copostigma* (*Clematostigma*) [in the sense of Roesler (1944)] (Smithers 1977) there remain only *C. dorsopunctatum*, *C. insolitum* Banks, *C. laconia* Banks, *C. pindapaiense* Williner and *C. trimaculata* (Hagen), the last named having been transferred to *Copostigma* by Banks (1938). Of these only *C. dorsopunctatum* and possibly *C. trimaculata* agree with the generic definition; *C. insolitum*, *C. laconia* and *C. pindapaiense* appear to agree, according to the illustrations provided with the descriptions, with the definition of *Mecampsis* in that the first and second sections of Cu_{1a} are in a straight line and the first section is longer than the second. It may be of significance that these three species are New World species, as is *M. cinctifemur*, whereas *C. dorsopunctatum* is from New Guinea and *C. trimaculata* from Ceylon.

Unfortunately, there is at present no material for study of additional morphological features. It is clear, however from the illustration of *C. dorsopunctatum* that the first and second sections of Cu_{1a} are at an angle, with the first shorter than the second.

Summary of generic definitions and species lists

The information available from the study of new material of *Clematostigma maculiceps* provides an opportunity to present a summary of the known features of the genera involved in the difficult *Copostigma-Clematostigma-Maheella-Ptycta* complex. I have attempted below to summarize the features of these genera from this new material and as presented in and by inference from the literature and to give a species list for the genera other than *Ptycta*. *Ptycta* is at present being studied by Professor I. W. B. Thornton and it would be premature to attempt to list species until his work is completed.

Rearrangements and redefinitions may well be required when additional material of type species of some of the genera becomes available.

Copostigma Enderlein 1903

Rs and M joined by a crossvein. Pterostigmal spurvein present. Pterostigma broad, concave. First section of Cu_{1a} shorter than second at an angle to it. Genitalia not known.

Type species: *C. dorsopunctatum* Enderlein 1903. *Ann. hist.-nat. Mus. hung.* 1: 30, pl. IV.

Species included: *C. dorsopunctatum* and probably *C. trimaculatus* (Hagen).

Clematostigma Enderlein 1906

Rs and M fused for a length. Spurvein present. Pterostigma broad, concave. First section of Cu_{1a} longer than second, at an angle to it. Subgenital plate lobe long. Gonapophyses long, external valve with peculiar lobe. Hypandrium symmetrical, without teeth or apophyses. Phallosome closed and with external parameres.

Type species: *C. maculiceps* Enderlein 1903. *Ann. hist.-nat. Mus. Hung.* 1: 231, pl. IV.

Species included: *C. maculiceps* and possibly the following: *C. brevistylus* (Enderlein), *C. fumatum* (Enderlein), *C. hyalinum* (Okam.), *C. indicum* (Enderlein), *C. paraguayense* Enderlein, *C. subcostalis* (Okam.), *C. tunicum* Enderlein, *C. vinctum* (Enderlein).

Mecampsis Enderlein 1925

Rs and M joined by a crossvein. Spurvein present. Pterostigma concave, broad. First section of Cu_{1a} longer than second, in straight line with it. Genitalia not known.

Type species: *M. cinctifemur* Enderlein 1925. *Konowia* 4: 104.

Species included: *M. cinctifemur* Enderlein, *M. insolitum* (Banks) comb. nov., *M. pindapaiense* (Williner) comb. nov., *M. laconia* (Banks) comb. nov.

Indiopsocus Mockford 1974

Rs and M fused for a length. Spurvein present or absent. Pterostigma concave, broad. First section of Cu_{1a} shorter than second, at an angle to it. Subgenital plate variable, usually not especially long. Gonapophyses not long, external valve lobe not of form as in *Clematostigma*. Hypandrium asymmetrical, usually with teeth or apophyses. Phallosome closed, without external parameres.

Type species: *P. texanus* Aaron 1886. *Proc. Acad. nat. Sci. Philad.* 38: 16.

Species included: *I. affinis* Mock., *I. alticola* Mock., *I. bisignatus* (Banks), *I. camaguayensis* Mock., *I. ceterus* Mock., *I. cubanus* (Banks), *I. dentatus* Mock., *I. infumatus* (Banks), *I. insulans* (Chapman), *I. jamaicensis* Turner, *I. microvariegatus* Mock., *I. palisadensis* Turner, *I. pallidus* Mock., *I. pulchra* Turner, *I. texanus* (Aaron), *I. ubiquitous* Mock., *I. variegatus* Mock.

Ptycta Enderlein 1925

Characters as for *Indiopsocus* except some species have Rs and M joined by a crossvein and the phallosome is usually narrower anteriorly than in *Indiopsocus*.

Type species: *P. haleakalae* Perkins 1899. *Fauna Hawaii* 2: 77.

Species included are not listed here as the genus is currently being studied by Professor I. W. B. Thornton and such a list may be misleading at this time.

Tanystigma gen. nov.

Rs and M fused for a length. Spurvein present. Pterostigma elongate, relatively narrow, concave or convex basad of spurvein. First section of Cu_{1a} longer than second and at an angle to it. Subgenital plate lobe short. Gonapophyses short, external valve lobe not of form as in *Clematostigma*. Hypandrium symmetrical, with teeth or apophyses. Phallosome open posteriorly, with external parameres.

Type species: *C. paulum* Smithers 1977. *Rec. Aust. Mus.* 31(7): 283, figs 75-85.

Species included: *T. dubium* (New) comb. nov., *T. edwardsi* (New) comb. nov., *T. inglewoodense* (New) comb. nov., *T. latimentula* (Smithers) comb. nov., *T. paulum* (Smithers) comb. nov., *T. tardipes* (Edwards) comb. nov.

Tiliapsocus gen. nov.

Rs and M fused for a length. Spurvein present. Pterostigma concave, broad. First section of Cu_{1a} shorter than round. Gonapophyses short, external valve lobe not conspicuous. Parthenogenetic.

Type species: *P. morio* Latreille 1794. *Bull. Soc. philom. Paris* 1: 85.

Only one species: *T. morio* (Latreille) comb. nov.

Key to genera of Psocinae with a spurvein on pterostigma

The following key should be used as an aid to identification only; the full generic definitions should always be consulted as there is considerable variation in *Ptycta*, which is only dubiously separable from *Indiopsocus*.

1. Pterostigma elongate, narrow; hind margin concave or convex basad of spurvein *Tanystigma*
- Pterostigma broad, concave basad of spurvein 2
2. Rs and M joined by a crossvein 3
- Rs and M fused for a length 4
3. First section of Cu_{1a} shorter than second and at an angle to it *Copostigma*
- First section of Cu_{1a} longer than second and in a straight line with it *Mecampsis*
4. First section of Cu_{1a} longer than second . . . *Clematostigma* (some *Ptycta*)
- First section of Cu_{1a} shorter than second 5
5. Subgenital plate with short, rounded, posterior lobe *Tiliapsocus*
- Subgenital plate with posterior lobe of various forms but not as in *Tiliapsocus* *Ptycta* and *Indiopsocus*

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